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Stapled Set(s) Color Documents or B/W Photographs

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The United States of America



The Commissioner of Patents and Trademarks

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extension.

Bence Lehman

Commissioner of Patents and Trademarks

Maryoie v. Turner

Attest



US005662731A

United States Patent [19]

Andersen et al.

[11] Patent Number: **5,662,731**[45] Date of Patent: **Sep. 2, 1997****[54] COMPOSITIONS FOR MANUFACTURING FIBER-REINFORCED, STARCH-BOUND ARTICLES HAVING A FOAMED CELLULAR MATRIX****[75] Inventors:** Per Just Andersen; Simon K. Hodson, both of Santa Barbara, Calif.**[73] Assignee:** E. Khashoggi Industries, Santa Barbara, Calif.**[21] Appl. No.:** 327,524**[22] Filed:** Oct. 21, 1994**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 288,664, Aug. 9, 1994, and Ser. No. 288,667, Aug. 9, 1994, which is a continuation-in-part of Ser. No. 218,971, Mar. 25, 1994, Ser. No. 109,100, Aug. 18, 1993, abandoned, Ser. No. 95,662, Jul. 21, 1993, Pat. No. 5,385,764, and Ser. No. 982,383, Nov. 25, 1992, abandoned, each is a continuation-in-part of Ser. No. 929,898, Aug. 11, 1992, abandoned, said Ser. No. 288,664, is a continuation-in-part of Ser. No. 929,898.

[51] Int. Cl.⁶ C04B 14/38; C08L 3/02**[52] U.S. Cl.** 106/206.1; 106/217.01; 106/400; 521/68; 521/84.1; 536/102; 536/107; 523/128**[58] Field of Search** 524/442, 445, 524/449, 493; 521/68, 84.1; 536/102, 107; 523/128; 106/206.1, 217.01, 400**[56] References Cited****U.S. PATENT DOCUMENTS**

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Compositions, methods, and systems for manufacturing articles, particularly containers and packaging materials, having a fiber-reinforced, starch-bound cellular matrix. Suitable mixtures used to form the articles are prepared by first preparing a viscous preblended mixture comprising water, a gelatinized starch-based binder, and fibers having an average length greater than about 2 mm. The highly viscous preblended mixture effectively transfers the shearing forces of the mixer to the fibers. The final moldable mixture is then prepared by mixing into the preblended mixture the remaining starch-based binder, water, and other desired admixtures, e.g., mold-releasing agents, inorganic filler rheology-modifying agents, plasticizers, coating materials, and dispersants, in the correct proportions to form an article which has the desired performance criteria. The moldable mixtures are heated between molds at an elevated temperature and pressure to produce form-stable articles having a desired shape and a selectively controlled foamed structural matrix. The articles may be manufactured to have properties substantially similar to articles presently made from conventional materials like paper, paperboard, polystyrene, plastic, or other organic-based materials and have especial utility in the mass-production of containers, particularly food and beverage containers.

31 Claims, 25 Drawing Sheets